

Checkup #3: Linear Relationships Page 1

1. Steps...

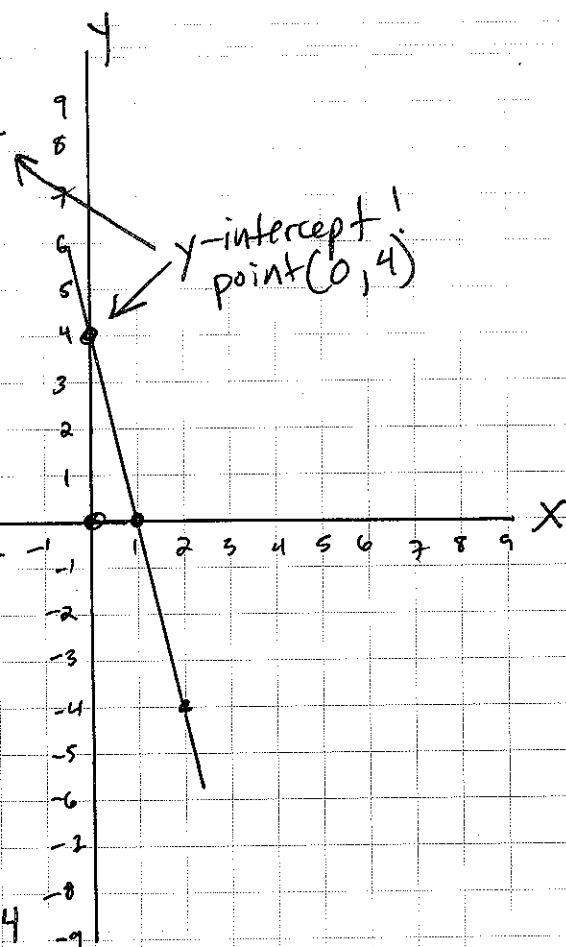
- 1.) Choose two points located on the line and label them. The best points are those that cross at the place the grid lines on the graph paper cross.
- 2.) Use the two points to calculate slope & y-intercept.
 *Shortcut... if the graph shows the y-intercept you may not have to calculate it, depending on what the instructions say.
- 3.) Write the final equation in the space provided.

Line A	Line B	Line C
use points: $(-2, 4) \text{ ; } (0, 2)$ $\Delta y = -2$ $\Delta x = +2$	use points: $(0, -2) \text{ ; } (4, 4)$ $\Delta y = +6$ $\Delta x = +4$	use points: $(0, -6) \text{ ; } (4, -4)$ $\Delta y = +2$ $\Delta x = +4$
calculate slope: $\frac{\Delta y}{\Delta x} = \frac{-2}{+2}$ <u>slope = -1</u>	calculate slope: $\frac{\Delta y}{\Delta x} = \frac{6}{4} = \frac{3}{2}$ slope = $\frac{3}{2}$	calculate slope: $\frac{\Delta y}{\Delta x} = \frac{2}{4} = \frac{1}{2}$ slope = $\frac{1}{2}$
Calculate y-intercept "b": use point $(-2, 4)$ $x = -2$ $y = mx + b$ $y = 4$ $4 = -1(-2) + b$ $m = -1$ $4 = 2 + b$ $4 - 2 = b$ $2 = b$	Calculate y-intercept "b": use point $(0, -2)$ $x = 0$ $y = mx + b$ $y = -2$ $-2 = \frac{3}{2}(0) + b$ $m = \frac{3}{2}$ $-2 = 0 + b$ $b = -2$	Calculate y-intercept "b": use point $(0, -6)$ $x = 0$ $y = mx + b$ $y = -6$ $-6 = \frac{1}{2}(0) + b$ $m = \frac{1}{2}$ $-6 = 0 + b$ $b = -6$
Final equation: $y = -x + 2$	Final equation: $y = \frac{3}{2}x - 2$	Final equation: $y = \frac{1}{2}x - 6$

* In all three lines A, B, & C you could see the y-intercept from the graph. I showed how you would calculate "b" for the times you can't see it on the graph.

Problem 1d.

Graph the equation $y = -4x + 4$



There are 2 methods to do this...

Basic

Method 1: create t-chart then graph points.

x	y	working out
0	4	$y = -4(0) + 4 = 4$
1	0	$y = -4(1) + 4 = 0$
2	-4	$y = -4(2) + 4 = -8 + 4 = -4$

Method 2: ^{Shows} More advanced understanding.

Step 1: plot the y-intercept.

Step 2: use the slope to determine the location of the next point. Since slope is the $\frac{\text{change in } y}{\text{change in } x}$ you will know where to move.

In this problem the slope is -4 , this means the $\frac{\Delta y}{\Delta x}$ is $\frac{-4}{1}$ which means down 4 to the right 1.

Since a slope of -4 could also mean $\frac{\Delta y}{\Delta x} = \frac{4}{-1}$ which would be up 4 to the left 1.

★ using these steps will allow you to graph any equation of a straight line you get.

Problem set #2 Continued.

Page 3

(e) check e. $x = \frac{-32}{5}$

$$\frac{3(x+2)}{4} = \frac{1}{6} - \frac{4-x}{3}$$

substitute
 $\frac{-32}{5}$ in for x

$$3\left(\frac{-32}{5} + 2\right) \div 4 = \frac{1}{6} - \left(4 - \frac{-32}{5}\right) \div 3$$

$$3\left(\frac{-32}{5} + \frac{10}{5}\right) \div 4 = \frac{1}{6} - \left(\frac{20}{5} + \frac{32}{5}\right) \div 3$$

$$3\left(\frac{-22}{5}\right) \div 4 = \frac{1}{6} - \left(\frac{52}{5}\right) \div 3$$

$$\frac{-66}{5} \div 4 = \frac{1}{6} - \left(\frac{52}{5} \times \frac{1}{3}\right)$$

$$\frac{-66}{5} \times \frac{1}{4} = \frac{5}{6} - \left(\frac{52}{15}\right) \frac{2}{2}$$

$$\frac{-66}{20} = \frac{5}{30} - \frac{104}{30}$$

$$\frac{-33}{10} = \frac{-99}{30}$$

$$\frac{-33}{10} = \frac{-33}{10} \checkmark \text{ checks.}$$

(f) $F(d^2) = G(m_2 - m_1)$ solve for G check:

$$\frac{F(d^2)}{(m_2 - m_1)} = \frac{G(m_2 - m_1)}{(m_2 - m_1)}$$

$$G = \frac{F(d^2)}{(m_2 - m_1)}$$

$$F = \frac{F(d^2)}{(m_2 - m_1)} (m_2 - m_1)$$

$$F = F \checkmark \text{ checks.}$$

Problem set #3

Page 4

Regular Ticket:

Cost is \$160 per ticket

Frequent Sailors Club:

Cost is a \$560 membership fee then \$90 a ticket.

a.

Trips	Cost	Trips	Cost
0	\$0	6	960
1	\$160	7	1120
2	\$320	8	1280
3	\$480	9	1440
4	\$640	10	1600
5	\$800		

a.

Trips	Cost	Trips	Cost
0	\$560	6	1100
1	\$650	7	1190
2	\$740	8	1280
3	\$830	9	1370
4	\$920	10	1460
5	\$1010		

b.

$$\text{Total Cost} = \$160(\text{\# of trips})$$

$$y = 160x$$

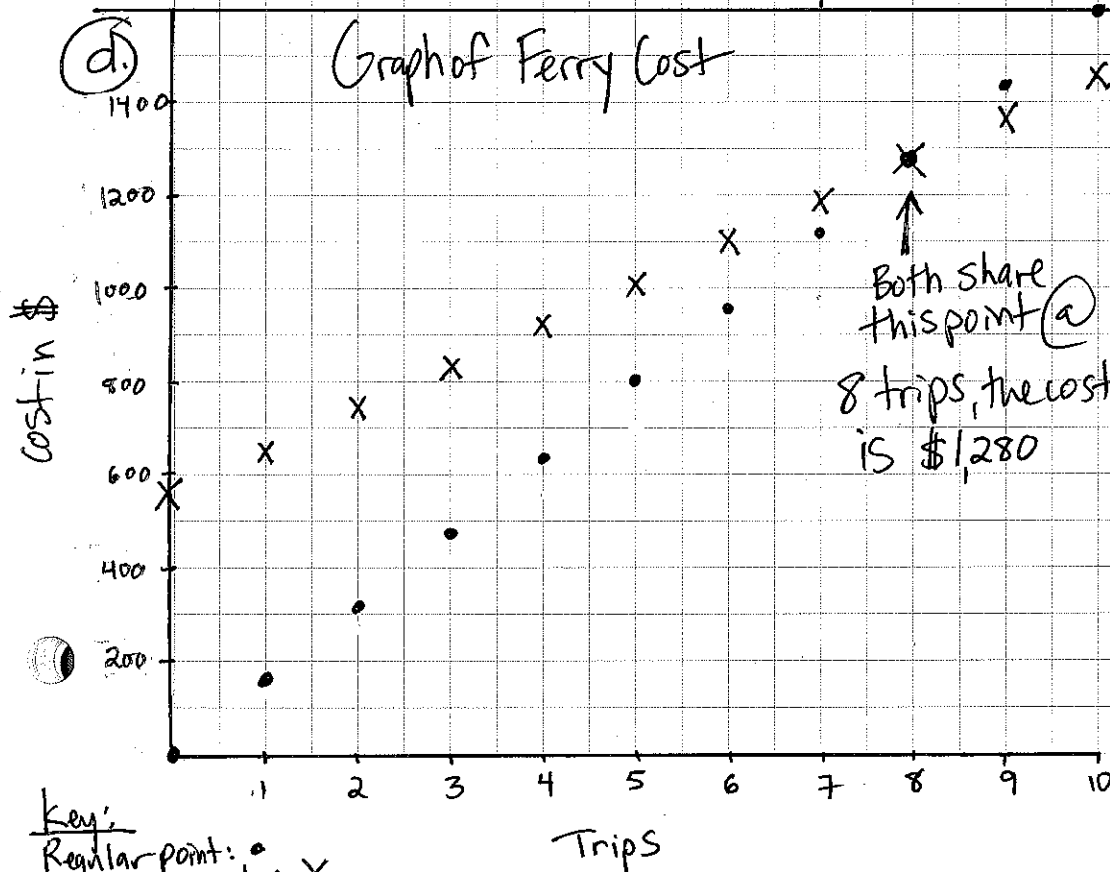
c.

$$\text{Total Cost} = \$90(\text{\# of trips}) + \$560$$

$$y = 90x + 560$$

d.

Graph of Ferry Cost



Key:

Regular point: •
Sailor club point: X

Both share this point (a)
8 trips, the cost is \$1,280

* The regular ticket plan is the better price for under 8 trips, but as you can see on the graph the greater slope of the regular plan finally makes it cost more @ 9 trips.

If Soo Bin is taking more than 7 trips she should join the Sailors Club.

Problem Set #4

Page 5

Time 9

- Candle burning and height of candle is a linear relationship you are given two pieces of data.

- after 2 minutes, the candle is 20cm high

- after 9 minutes, the candle is 16.5cm high

* Do the equation 1st! Part b.

9. Complete the Table:

x Time	y Height of Candle	
2	20	Since the slope is
3	19.5	-0.5, this means
4	19.0	the height is getting
5	18.5	smaller by
6	18.0	0.5cm each
7	17.5	minute it burns.
8	17.0	
9	16.5	

b. you have 2 points.

$(2, 20)$ $(9, 16.5)$

Time height

$$\text{find slope: } \frac{\Delta y}{\Delta x} = \frac{-3.5}{+7}$$

$$\text{slope} = -0.5$$

Find y-intercept: use point $(2, 20)$

$$x = 2$$

$$y = 20$$

$$m = -0.5$$

$$y = mx + b$$

$$20 = -0.5(2) + b$$

$$20 = -1 + b$$

$$+1 \quad +1$$

$$b = 21$$

$$\text{Final equation } y = -\frac{1}{2}x + 21$$

$$\text{or } y = -0.5x + 21$$

c. since the height is the value of y, and we want to know how long it will take for the height to be zero

use this equation with

"0" substituted for "y".

$$\begin{array}{l} \text{Substitute} \\ \text{zero} \end{array} \rightarrow \begin{array}{l} y = -0.5x + 21 \\ 0 = -0.5x + 21 \\ -21 \quad -21 \end{array}$$

$$\begin{array}{r} -21 = -0.5x \\ -0.5 \quad -0.5 \end{array}$$

$$x = \frac{-21}{-0.5}$$

$$x = 42$$

It will take 42 minutes for the candle to reach a zero height.

$$\text{check answer: } 0 = -0.5(42) + 21$$

$$0 = -21 + 21$$

$$0 = 0 \checkmark \text{check}$$

Problem set #5

Find the equation:
a. slope 3 y-intercept $(0, -2)$

final equation: $y = 3x - 2$ "b" is -2!

Problem Set #6

Hint: To check if a relationship is linear check to see if the independent variable (y) changes constantly as the dependent variable (x) changes.

a. Distance vs time walking 3m/s

- Since the walker is staying at a constant speed the relationship is Linear.

Linear

c. $x = 2$

x	y
2	0
2	1
2	2
2	3
2	4

Forms a vertical straight line.

This is Linear.

Linear

Page 6

b. points $(-2, -4), (1, 5)$

Find slope $(-2, -4) (1, 5)$

$$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{+9}{+3}$$

$$\text{slope} = 3$$

Find "b", use point $(1, 5)$

$$\begin{aligned} x &= 1 & y &= mx + b \\ y &= 5 & 5 &= 3(1) + b \\ m &= 3 & 5 &= 3 + b \\ & & -3 & -3 \\ & & 2 &= b \end{aligned}$$

Final equation $y = 3x + 2$

b. $y = 3x^2 - 2$

x	y
0	-2
1	1
2	10

The value of y increases more and more as x increases, the increase is not constant, so not Linear

Non-Linear

d. value of horse over time if it doubles every 3 years.

x years	y value
1	1
2	2
3	4
4	8
5	16

not constant change

Not Linear